Neurodynamical model for multi-stability and adaptation in motion recognition

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The perception of body motion can show multi-stability with respect to the perceived walking direction (Vanrie, Dekeyser, Verfaillie, 2004). This phenomenon is not captured by existing neural models. I present a new neurodynamical model that is based on a 2D neural field of snapshot neurons. Encoding individual views of key frames of actions. These (nonlinear) neurons are coupled by lateral connections, which are symmetric with respect to neurons encoding different views, and asymmetric for neurons encoding different snapshots, resulting in temporal sequence selectivity. In addition, the neurons adapt after they have been activated, where the adaptation dynamics was fitted to electrophysiological data on repetition-suppression in area IT (de Baene & Vogels, 2010). The model reproduces perceptual switching and sequence selectivity of visual action recognition. In addition, quantitative fitting of neural and psychophysical data leads to the following conclusions:
1) Perceptual switching in action perception is driven by noise, not adaptation.
2) Consistent with recent data (Caggiano et al. 2013), the model predicts correctly that repetition-suppression in action-selective neurons is much smaller than in shape-selective neurons.
3) It predicts a new action stimulus that should result in much stronger repetition-suppression than the stimuli used in previous physiological and imaging-experiments.

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